something else must be devised than the existing cumbersome and unsatisfactory scheme of vaguely defined geological formations, having no comparable limits in the different geological provinces and even diverse values in the same province, some plan that must be natural and at the same time elastic. Practical experience in the field and the demands of the times soon pointed out a feasible scheme. So well has it served the purpose, and so readily adaptable is it to the changing conditions met with on all sides and to all the unforeseen exigencies continually arising, that it has brought under its standard nearly every practical field geologist.

The present method of designating geological formations by geographical names certainly does greatly expand the nomenclature at times seemingly to a burdensome extent. This appears to be the only objection that has been urged against the plan that might call for notice. Yet, to all except those who do not wish to go beyond the ordinary text-book in geological work, even this seems hardly worthy of special argument, since it is offset by so many manifest advantages.

It may be truly said that no greater boon to the working, as well as to the theoretical, geologist has been devised. Incorporated in the new plan are practically all of the salient good features of the old method, while none of the many objectionable ones are retained. Since its adoption a vast mass of exact information has been obtained that was previously unthought of—information that is in shape to be always used, without the necessity of going all over the ground again; the other departments of geology have been greatly aided, and stratigraphical geology itself has been capable of making greater real progress in the one short decade that has elapsed since the method came into use than in all time previous. In the same short period more has been learned about the real nature of sedimentation, the actual relations existing between different rock formations and the structure of the layered cuticle of the globe, than was possible before. In fact, a rational basis for geological correlation and a genetic classification of formations has been found.

The real meaning, then, of the multitude of new titles that has recently made its appearance in the literature of stratigraphy is the practical adoption of more refined methods of geological work, the provision of means for the collection of more exact geological data and the grasping of more rational conceptions regarding geological correlation and classification.

Charles R. Keyes.

SCIENTIFIC LITERATURE.

Die Farnkräuter der Erde. By H. Christ. Jena, Gustav Fischer. 1897. Mit 291 Abbildungen. 8vo. Pp. 388. 12 M.

In the preparation of such a work as the above one is expected either to have in mind the filling of a felt want, or at least to furnish a sufficient reason for the expenditure of so much energy. Neither of these seems to have been considered in the present case, if we judge of the work by the test of completeness which the title would lead us to expect. The purpose of the work seems to be the presentation of the general systematic relations of the genera and characteristic species of ferns, without attempting completeness either in the flora of a given region or the full quota of species of any particular group. As a manual for the identification of species its value can only be slight, as it is most likely to be deficient at the point where it is most needed, for usually there is no suggestion whatever of the nature, distribution or number of the allied species, and the specific descriptions that are given are not uniformly full, many of them being very incomplete. The work will be useful within narrow limits, however, particularly among florists and those to whom scientific accuracy is not so uniformly important. It describes more or less completely 1154 species of ferns, which, at a moderate estimate, cannot much exceed one-third of the known species of the world.

The system of classification is not strikingly novel, following in the main that of Mettenius and Prantl. While the number of recognized genera (99) is considerably larger than that recognized at Kew, which has been followed in this country, it will by no means satisfy those who regard genera, among ferns as elsewhere, as natural groups of organisms closely connected in habit and other biological characters, instead of artificial groups thrown together for conven-

ience according to the presence or absence of some unimportant structure. Presl, who was one of the first to recognize natural divisions among the ferns, gave us 230 genera; John Smith, with the advantage of the Kew collection and the largest number of species anywhere in cultivation, only reduced this number to 220; while Fee, the illustrious French pteridologist, recognized 181, and Moore a little later 177. The Kew authorities recognize only 78 including recent additions.

The system followed in the present work can be best judged perhaps by the following outline of its main features:

LEPTOSPORANGIATÆ.

(*Polyangia.*)

Hymenophyllaceæ.
Polypodiaceæ.
- Acrosticheæ.
- Vittarieæ.
- Gymnogrammeæ.
- Polypodieæ.
- Pterideæ.
- Aspleniaceæ (*sic*).
- Aspidiaceæ (*sic*).
- Davalliaceæ (*sic*).

Cyatheaceæ.
Osmundaceæ.

(*Oligangia.*)

Matoniaceæ.
Gleicheniaceæ.

(*Monangia.*)

Schizæaceæ.
Parkeriaceæ.

EUSPORANGIATÆ.

Marattiaceæ.
Ophioglossaceæ.

Concerning the arrangement of families there would probably be little difference of opinion except that from an evolutionary standpoint the order should be inverted and the position of the Hymenophyllaceæ would be called in question. The tribes of the Polypodiaceæ will permit more diversity of opinion. Among the good points to be noted are the removal of *Notholæna* (wrongly printed *Nothochlæna*) to the Pterideæ, where it stands next to its close ally, *Cheilanthes;* the removal of *Lindsaya*, *Nephrolepis* and *Loxsoma*, to the Davallieæ; also the formation of distinct families for the aberrant *Matonia* and *Ceratopteris*. The separation of the unique *Platycerium* from the Acrosticheæ is well timed, but it finds a resting place just as unsatisfactory next to *Polypodium* and always will be a migrant until it is placed in a distinct family of which it is worthy on account of its unique characters.

The divisions of genera are interesting, but exceedingly unequal. *Acrostichum* as recognized by Baker here appears under seven or eight genera, but the equally composite *Gymnogramme* is grouped under only three generic names, though some of its species are relegated to *Polypodium* and *Phegopteris*. *Hemidictyon*, *Ceterach*, *Diplazium* and *Athyrium* (the latter including *A. filix-fœmina*) are separated from *Asplenium*, while the equally distinct *Thamnopteris* (*A. nidus*) and *Darea* are still left in the genus, and the more distinct *Camptosorus* and *Schaffneria* are still left in the same genus as *Scolopendrium*. *Struthiopteris* is very properly separated from *Onoclea*, and *Cibotium* and *Dennstedtia* from *Dicksonia*, though in each case there are complications of nomenclature that will demand a later settlement. Both *Polystichum* and *Nephrodium* are united under *Aspidium* and *Fadyenia* is also included, contrary even to the conservative Kew practice. We are still very far from a natural segregation of the genera of ferns.

The recognition of species, especially those of American origin, is exceedingly faulty. The combination of *Notholæna candida*, *N. Hookeri* and *N. cretacea* into one species is no less notorious than the reduction of *Aspidium Goldieanum* and *A. marginale* to varieties of *A. filix-Hymas*. Quite a number of our American species appear under new names, which will be a new source of grief to conservative botanists, who are troubled because names will change with the advance of investigation. Among these not already mentioned we note:

Chrysodium aureum instead of *Acrostichum aureum*.

Neurodium lanceolatum instead of *Tænitis lanceolata*.

Blechnum spicant instead of *Lomaria spicant*.

Dennstedtia punctiloba instead of *Dicksonia punctiloba*.

The work is illustrated by 291 cuts, which, if not elegant, are mostly sufficiently accurate, and characteristic of the species indicated, to be of value; many of them are original. Two or three new species appear in the work for the first time.

Lucien M. Underwood.

The Calorific Power of Fuels. By Herman Poole, F.C.S., etc. New York, J. Wiley & Sons; London, Chapman & Hall. 1898. 8vo. Pp. xv + 255.

The importance of a work on this subject is to-day vastly more evident, and is very much greater than before the days of scientific discussion, investigation and experimental researches in connection with the processes of modern engineering in the department of heat production and utilization. The extensive application of scientific methods by the engineer in his steam engine and boiler trials, and in a thousand other lines of professional work, also makes the subject and such compilation of facts and data peculiarly important. A work specially devoted to this subject thus assumes rare value.

This treatise is based upon M. Scheurer-Kestner's *Pouvoir calorifique des combustibles* and has been worked into a shape which adapts it to our own data and methods and includes later developments both of method and of apparatus. It gives us an excellent general discussion of the calorimetric principles and of the calorimetric apparatus now available for use by the chemist and by the engineer, and, with especial fullness, all of those found helpful in commercial work.

The fuels are described at considerable length and their heating powers given as computed from their composition and checked by direct calorimetric measurement. The report of the committee of the American Society of Mechanical Engineers on exact methods of steam boiler trial is introduced, and a large quantity of data and an excellent bibliography are appended, the latter including numerous and helpful references to the files of scientific journals. The 'Fuel Table,' in which are given the composition and the calorific power of the fuels of the world, is the most extensive yet produced and is extremely interesting and valuable.

The book is well up to date and includes descriptions of the latest calorimeters, as Berthelot's, Mahler's Barrus' and Carpenter's, gives Ringelmann's 'smoke scale,' Kent's revision of 'Johnson's Report on Coals,' and other no less important recent contributions to the literature of the subject.

The book is one which is likely to find its way into the library of all chemists and of all engineers having to do with applications of the calorific power of fuels. It is well written, well published and of moderate cost.

R. H. Thurston.

SCIENTIFIC JOURNALS.

The Journal of Physical Chemistry. The January number begins the second volume of this journal. The opening article is the first part of an extensive paper 'On the General Problem of Chemical Statics:' by P. Duhem, Professor of Theoretical Physics at Bordeaux. The paper is "a commentary on and a complement to the celebrated memoir of J. Willard Gibbs, 'On the Equilibrium of Heterogeneous Substances.'" The second article, 'Fractional Crystallization:' by C. A. Soch, is a contribution to the theory of separations by fractional crystallization. 'Distribution of Mercuric Chlorid between Toluene and Water:' by Oliver W. Brown, completes the original matter. Several pages are devoted to book reviews. The department of reviews of the journal literature of physical chemistry is very full and critical.

February. 'Solutions of Silicates of the Alkalies:' by Louis Kahlenberg and Azariah T. Lincoln. From freezing point and conductivity determinations of solutions of the silicates of sodium, potassium, lithium, rubidium and cesium, it is concluded that in such solutions the silicate is hydrolytically decomposed into the caustic alkali and colloidial silicic acid. 'On the General Problem of Chemical Statics:' by F. Duhem. The conclusion of the paper begun in the January number. 'On Integrating Factors:' by P. Saurel. A mathematical introduction to theoretical studies that are to follow. 'Vapor-tension of Concentrated Hydrochloric Acid Solutions:' by F. R. Allan. It is concluded that electrolytic dissociation is not an